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| 10/724,141 | 12/01/2003 | Grit Schwalbe | INF-119 | 1224 |
| 48154 | 7590 | 06/28/2005 | EXAMINER | |
| SLATER & MATSIL LLP 17950 PRESTON ROAD SUITE 1000 DALLAS, TX 75252 | | | PHAM, THANHHA S | |
| | | | ART UNIT | PAPER NUMBER |
| | | | 2813 | |

DATE MAILED: 06/28/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/724,141

Applicant(s)

SCHWALBE ET AL.

Examiner

Thanhha Pham

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 February 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date #2/01/2003.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Oath/Declaration

1. Oath/Declaration filed on 04/21/2004 has been considered.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. **Claims 15-16 are rejected under 35 U.S.C. 102(b) as being anticipated by Annaprgada [US 6,413,877].**

Annaprada (figs 3-4's, col. 1-5) discloses the claimed method for patterning a dielectric layer on a semiconductor substrate comprising:

providing a first layer (408, fig. 4A, col. 3 lines 1-5);,

depositing at least one layer (404/412, fig 4A, col. 3 lines 2-3) formed from a dielectric on the first layer, so that a dielectric layer is obtained;

depositing a photosensitive resist layer (col. 3 lines 10-16) on the dielectric layer (404/412)

exposing and developing the resist layer in sections, so a resist mask (416, fig. 4A, col. 3 lines 10-16) is obtained, through which sections of the dielectric layer are uncovered;

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removing the dielectric layer in the sections which have been uncovered through the resist mask (416, figs 4A-4B) at least down to a depth such that the first layer (408) is uncovered;

incinerating a resist mask in an oxygen plasma being generated from a gas which at least contains oxygen gas and a forming gas (O₂/N₂, fig 4C, col 3 lines 23-30) so that a patterned dielectric layer is obtained; and

cleaning the patterned dielectric layer using aqueous dilute hydrofluoric acid (fig. 4D, col. 3 lines 33-48).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-3, 5-8, 10-13, 17-18 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Annapragada [US 6,413,877] in view of Kitagawa [US 2001/0005635].

► With respect to claims 1, 11 and 17, Annaprada (figs 3-4's, col. 1-5) discloses the claimed method for patterning a dielectric layer on a semiconductor substrate comprising:

providing a first layer (408, fig. 4A, col. 3 lines 1-5) [*claims 1 and 11*];

depositing at least one layer (404/412, fig 4A, col. 3 lines 2-3) formed from a dielectric on the first layer, so that a dielectric layer is obtained *[claims 1 and 11]*;

depositing a photosensitive resist layer (col. 3 lines 10-16) on the dielectric layer (404/412) *[claims 1 and 11]*;

exposing and developing the resist layer in sections, so a resist mask (416, fig. 4A, col. 3 lines 10-16) is obtained, through which sections of the dielectric layer are uncovered *[claims 1 and 11]*;

removing the dielectric layer in the sections which have been uncovered through the resist mask (416, figs 4A-4B) at least down to a depth such that the first layer (408) is uncovered *[claims 1 and 11]*;

incinerating a resist mask in an oxygen plasma being generated from a gas which at least contains oxygen gas and a forming gas (O_2/N_2 , fig 4C, col 3 lines 23-30) so that a patterned dielectric layer is obtained *[claims 1 and 11]*; and

cleaning the patterned dielectric layer using aqueous dilute hydrofluoric acid (fig. 4D, col. 3 lines 33-48) *[claims 1 and 11]* wherein a wet-chemical clean is carried out after the resist mask has been incinerated *[claim 10]*.

Annapragada does not expressly show the claimed parameters for incinerating: the resist mask wherein the incineration being carried out at a temperature which is selected to be approximate 200°C or lower, the oxygen gas being present in an amount of approximately 60% or less by volume and the forming gas being present in an amount of approximately 40% or more by volume *[claims 1, 11 and 17]*.

However, Kitagawa (figs 1-4, abstract, text [0010]-[0072]) discloses using the parameter as being claimed for incinerating would improve characteristic of removing the resist mask without degrading the patterned dielectric layer.

Therefore, at the time of invention, it would have been obvious for those skilled in the art to modify process of Annapragada by using parameters as being claimed for incinerating the resist mask without damaging the patterned dielectric layer.

► With respect to claims 2-3, 7-8, 12-13, and 18, the claimed ranges of duration and pressure for incinerating the resist mask and the claimed ranges of concentration and time for cleaning the patterned dielectric layer using hydrofluoric acid solution are considered to involve routine optimization while has been held to be within the level of ordinary skill in the art. As noted in *In re Aller* 105 USPQ233, 255 (CCPA 1955), the selection of reaction parameters such as temperature and concentration would have been obvious.

"Normally, it is to be expected that a change in temperature, or in concentration, or in both, would be an unpatentable modification. Under some circumstances, however, changes such as these may be impart patentability to a process if the particular ranges claimed produce a new and unexpected result which is different in kind and not merely degree from the results of the prior art...such ranges are termed "critical ranges and the applicant has the burden of proving such criticality... More particularly, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation."

See also In re Waite 77 USPQ 586 (CCPA 1948); In re Scherl 70 USPQ 204 (CCPA 1946); In re Irmischer 66 USPQ 314 (CCPA 1945); In re Norman 66 USPQ 308 (CCPA 1945); In re Swenson 56 USPQ 372 (CCPA 1942); In re Sola 25 USPQ 433 (CCPA 1935); In re Dreyfus 24 USPQ 52 (CCPA 1934).

► With respect to claims 5-6 and 20, Annapragada (col 3 lines 1-36) discloses the first layer (408) composed of silicon and the dielectric layer (404/412) comprise at least one layer (OSG) composed of a silicate glass and/or a silicon carbide.

4. Claims 4, 14 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Annapragada [US 6,413,877] in view of Kitagawa [US 2001/0005635] as applied to claims 1, 11 or 17 above in further view of You et al [US 6,235,453].

Annapragada in view of Kitagawa substantially discloses the claimed method including incinerating the resist mask in oxygen plasma wherein the oxygen plasma being generated for a gas which at least contains oxygen gas (O₂) and a forming gas (N₂). Annapragada in view of Kitagawa does not expressly teaches the forming gas at least contains nitrogen and hydrogen. However, using oxygen together with the forming gas containing nitrogen and hydrogen for incenerating the resist mask has been known in the art. Selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945) "Reading a list and selecting a known compound to meet known requirements is no more ingenious than selecting the

last piece to put in the last opening in a jig-saw puzzle." 325 U.S. at 335, 65 USPQ at 301. See also *In re Leshin*, 227 F.2d 197, 125 USPQ 416 (CCPA 1960) (selection of a known plastic to make a container of a type made of plastics prior to the invention was held to be obvious). See *You et al* as an evidence that shows using $O_2/N_2/H_2$.

Therefore, at the time of invention, it would have obvious for those skilled in the art, in view of *You et al*, to use the forming gas together with oxygen as being claimed in the process *Annapragada* in view of *Kitagawa* to remove the resist mask after obtaining the patterned dielectric layer.

5. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over *Annapragada* [US 6,413,877] in view of *Kitagawa* [US 2001/0005635] as applied to claim 8 above, in further view of *Li* [US 6,576,547].

With respect to claim 9, dilute hydrofluoric acid comprises a buffer salt is a known etchant for cleaning the patterned dielectric layer. Selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945) "Reading a list and selecting a known compound to meet known requirements is no more ingenious than selecting the last piece to put in the last opening in a jig-saw puzzle." 325 U.S. at 335, 65 USPQ at 301. See also *In re Leshin*, 227 F.2d 197, 125 USPQ 416 (CCPA 1960) (selection of a known plastic to make a container of a type made of plastics prior to the invention was held to be obvious). See *Li* as an evidence that shows using aqueous dilute hydrofluoric acid comprising NH_4F for cleaning the patterned dielectric layer. Therefore, at the time of invention, it would have obvious for

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those skilled in the art, in view of Li, to use the claimed dilute hydrofluoric acid comprises a buffer salt as the known cleaning agent in the process Annapragada in view of Kitagawa to clean the patterned dielectric layer to provide a better semiconductor device.

Double Patenting

6. Applicant is advised that should claim 6 be found allowable, claim 20 will be objected to under 37 CFR 1.75 as being a substantial duplicate thereof. When two claims in an application are duplicates or else are so close in content that they both cover the same thing, despite a slight difference in wording, it is proper after allowing one claim to object to the other as being a substantial duplicate of the allowed claim. See MPEP § 706.03(k).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanhha Pham whose telephone number is (571) 272-1696. The examiner can normally be reached on Monday and Thursday 9:00AM - 9:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead can be reached on (571) 272-1702. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read 'Thanhha Pham', with a stylized, cursive script.

Thanhha Pham
Patent Examiner
Patent Examining Group 2800